

7. Waste Management Implications

7.1 Introduction

This section identifies the types of waste that are likely to be generated during the construction and operation phases of the Project, and evaluates the potential environmental impacts that may result from these wastes. Mitigation measures and good site practices, including waste handling, storage and disposal are recommended with reference to the applicable waste legislation and guidelines.

7.2 Environmental Legislation, Standards and Guidelines

7.2.1 Environmental Impact Assessment Ordinance

The criteria and guidelines for assessing waste management implications as outlined in Annexes 7 and 15 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM), respectively had been made reference to for conducting this EIA study.

The following legislation relates to the handling, treatment and disposal of wastes in the Hong Kong are used in assessing potential impacts:

- Waste Disposal Ordinance (Cap. 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)
- Public Health and Municipal Services Ordinance (Cap. 132) - Public Cleansing and Prevention of Nuisances Regulation (Cap. 132BK)
- Land (Miscellaneous Provisions) Ordinance (Cap. 28)

7.2.2 Waste Disposal Ordinance (Cap. 354)

The Waste Disposal Ordinance (WDO) prohibits the unauthorised disposal of wastes. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. Under the WDO, wastes can be disposed of only at designated waste disposal facilities.

Under the WDO, the Waste Disposal (Chemical Waste) (General) Regulation provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. The Environmental Protection Department (EPD) has also issued a 'guideline' document, the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulations on chemical wastes.

Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.

7.2.3 Public Health and Municipal Services Ordinance (Cap. 132)

The Public Cleansing and Prevention of Nuisances Regulation provides control on illegal tipping of wastes on unauthorised (unlicensed) sites.

7.2.4 Land (Miscellaneous Provisions) Ordinance (Cap. 28)

The inert portion of Construction and Demolition (C&D) materials (including rocks, soil, broken concrete, building debris, etc.) may be taken to public fill reception facilities. Public fill reception facilities (PFRFs) usually form part of land reclamation schemes and are operated by the Civil Engineering and Development Department (CEDD) and other scheme owners. The Land (Miscellaneous Provisions) Ordinance requires that individuals or companies who deliver public fill to the PFRFs to obtain Dumping Licences. The licences are issued by CEDD under delegated authority from the Director of Lands.

Individual licences and windscreen stickers are issued for each vehicle involved. Under the licence conditions, PFRFs will only accept soil, sand, rubble, brick, tile, rock, boulder, concrete, asphalt, masonry or used bentonite. In addition, in accordance with paragraph 11 of the Development Bureau (DEVB) Technical Circular (Works) (TC(W)) No. 6/2010, the Public Fill Committee will advise on the acceptance criteria. The material shall, however, be free from marine mud, household refuse, plastic, metal, industrial and chemical wastes, animal and vegetable matter and any other materials considered unsuitable by the PFRF supervisor.

7.2.5 Environmental Guidelines

Other guidelines specifying how the Contractor should implement the requisite mitigation measures and good site practices include the following:

- A Guide to the Registration of Chemical Waste Producers, Environmental Protection Department, Hong Kong
- A Guide to the Chemical Waste Control Scheme, Environmental Protection Department, Hong Kong
- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, Environmental Protection Department, Hong Kong
- Works Branch Technical Circular (WBTC) No. 2/93, Public Dumps
- WBTC No. 2/93B, Public Filling Facilities
- ETWB TC(W) No. 33/2002, Management of Construction/Demolition Materials including Rock (which has been subsumed under Section 4.1.3, Chapter 4, of the Project Administration Handbook for Civil Engineering Works)
- ETWB TC(W) No. 19/2005, Environmental Management on Construction Sites
- DEVB TC(W) No. 6/2010, Trip Ticket System for Disposal of Construction and Demolition Materials

7.3 Assessment Methodology

The criteria for assessing waste management implications are outlined in Annex 7 of the EIAO-TM. The methods for assessing potential waste management impacts during construction and operation phases of the Project follow those presented in Annex 15 of the EIAO-TM and include the following:

- Estimation of the types and quantities of the wastes generated;
- Assessment of potential impacts from the management of solid waste with respect to potential hazards, air and odour emissions, noise, wastewater discharges and public transport; and,
- Assessment of impacts on the capacity of waste collection, transfer and disposal facilities.

Opportunities for waste reduction have been initially assessed based upon the following:

- Avoidance and minimisation of waste generation throughout design, construction and operation phases;
- Segregation of waste materials be promoted and considered as the best management practices;
- Reuse and recycling on site or at other projects; and
- Material diversion to public fills as far as possible.

7.4 Identification of Environmental Impact

7.4.1 Potential Land Contamination from Previous and Present Use

With reference to **Appendix 7.1**, the area of concern was mainly vegetated land from 1956 to 1990. From 1993 to end of 2010, the EPD Sha Ling Livestock Waste Composting Plant was in use at the area of concern. No change of land use has occurred after 2010. The previous and present land use was not used for any activities under Table 2.3 of “Practice Guide for Investigation and Remediation of Contaminated Land” by EPD (i.e. petrol filling station, power plants, motor vehicle/equipment depot, repairing, service centres, etc.). According to the information obtained from EPD and FSD, there were no records on accidents of chemical spillage/leakage from EPD and no recorded on DG licences, spillage/leakage incidents of DG from FSD within in the proposed project area. Details of replies from EPD and FSD can be seen in **Appendix 7.2**. There is one record of a chemical waste producer being registered for the Project area. This is the service provider for the previous Sha Ling Livestock Waste Composting Plant, Waylung Waste Collection Limited. After confirmation with the company, 2 locations on site were confirmed as storage locations for diesel and lubricant oil and shown in **Appendix 7.2 and Appendix 7.3**. Further site inspections on 6 January 2012 and 27 June 2013 found that the diesel, lubricant oil and associated facilities are stored at appropriate covered storage facilities with protection measures such as drip tray. No visible oil stains and spillage were observed on the ground and the whole site area is paved with concrete. Therefore, assessment of land contamination is considered not necessary.

7.4.2 Construction Phase

The construction activities to be carried out for construction of the proposed Project would generate a variety of wastes that can be divided into distinct categories based on their composition and ultimate method of disposal. The identified waste types include:

- Excavated materials;
- Construction and demolition (C&D) materials;
- Chemical waste; and,
- General refuse.

7.4.3 Operation Phase

It is anticipated that operation of the proposed Project would involve waste generation from the following activities:

- Operation of facilities;
- Maintenance works; and
- Office activities.

A variety of wastes are expected to be generated from abovementioned activities through the operation of the Project. The types of wastes may be categorised as follows:

- Wastes generated from pre-treatment process;
- Chemical waste; and,
- General refuse.

7.5 Prediction and Evaluation of Environmental Impact

7.5.1 Construction Phase

7.5.1.1 Excavated Materials

During the construction phase, excavated materials will be generated from site formation, foundation works and the possible construction of access roads. It is estimated that approximately 25,000 m³ of materials would be excavated, of which 4,500 m³ could be reused on site.

Excavated materials should be reused on site for filling works (for example, site formation, backfilling and access road construction) as far as possible to minimise the net amount of such materials generated from the Project. With careful planning for reusing excavated materials on site, secondary environmental impacts and potential impacts on waste handling is expected to be minimal.

The quantities of excavated materials to be reused, delivered to public fill reception facility have been estimated in **Table 7.1**.

Table 7.1: Excavated Materials to be Generated, Reused and Delivered to Public Fill Reception Facility

Material Type	Estimated Amount of Excavated Materials to be Generated (m ³)
Excavated Materials (total)	25,000
Material Reused on Site	4,500
Material Delivered to Public Fill Reception Facility	20,500

The Project Proponent should obtain an agreement in advance with the Public Fill Committee to ensure that the public fill facility or facilities is/are able and capable of accepting the anticipated amount of excavated materials mentioned above.

With careful planning for reuse of excavated materials on site and proper implementation of waste management practices as described in **Section 7.6.1.3** and **Table 7.5**, the secondary environmental

impacts and potential impacts arising from on site waste handling of the excavated materials is expected to be minimal.

7.5.1.2 Construction and Demolition (C&D) Materials

C&D materials can be divided into two categories, namely inert materials and non-inert materials. Inert materials, such as rock and concrete, should be reused as much as possible. Whereas non-inert materials, including mixture of topsoil and dead vegetative material, timber, glass, steel and plastics are not suitable for backfilling. Subject to the recovery / recycling rate of non-inert materials, the rest of the materials should be disposed of at the landfills.

The following C&D materials are expected to be generated during the construction phase of the Project:

- Timber from formwork and falsework;
- Materials and equipment wrappings;
- Mixture of topsoil and dead vegetative material; and
- Surplus concrete or grouting mixes.

Approximately 4,000 m³ of C&D materials would be generated from the Project. A more detailed account of C&D material generation should be provided in the Environmental Management Plan (EMP) to be prepared by the Contractor.

The quantities of C&D materials to be reused, delivered to public fill reception facility and disposed of at landfills have been estimated as shown in **Table 7.2**.

Table 7.2: C&D Materials to be Generated, Reused, Delivered to Public Fill Reception Facility and Disposed of at Landfill

Material Type	Estimated Amount of C&D Materials to be Generated (m ³)
C&D Materials	4,000
Reused on Site	500
Inert Materials Delivered to Public Fill Reception Facility	2,700
Non-inert Materials Disposed of at Landfill	800

The Project Proponent should obtain an agreement in advance with the Director of Environmental Protection (DEP) to ensure that the landfill facilities are able and capable of accepting the anticipated amount of non-inert materials mentioned above.

With careful planning for reuse of C&D materials on site and proper implementation of waste management practices as described in **Section 7.6.1.3** and **Table 7.5**, the secondary environmental impacts and potential impacts arising from on site waste handling of the C&D materials is expected to be minimal.

7.5.1.3 Chemical Waste

During construction phase, construction plant and equipment would require regular maintenance and servicing that would generate chemical waste such as cleaning fluids, solvents and lubrication oil. Such

chemical waste would likely pose environmental and health and safety hazards if it is not properly managed in accordance with the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on Packaging, Labelling and Storage of Chemical Waste. These hazards may include:

- Toxic effects to workers;
- Adverse effects on water quality from spill; and
- Fire hazards.

Should there be any potential generation of chemical waste, the Contractor must register with EPD as a chemical waste producer. These types of waste would be accepted for disposal at the Chemical Waste Treatment Centre (CWTC) at Tsing Yi. A detailed account of chemical waste generation should be provided by the Contractor during preparation of the Waste Management Plan (WMP).

Provided that the relevant measures as described in **Section 7.6.1.4** and **Table 7.5** are properly implemented, the potential environmental impacts associated with the storage, handling and disposal of the chemical waste would be minimal.

7.5.1.4 General Refuse

Throughout the construction phase of the Project, the workforce would generate refuse comprising food scraps, waste paper, empty containers, etc. Rapid and effective collection of site wastes would be required to prevent waste materials being blown around by wind, flushes into nearby streams, or causing visual impacts. The work site may also attract pests and vermin and create odour nuisance if the waste storage area is not well maintained and cleaned regularly. Disposal of general refuse at sites other than approved waste transfer or disposal facilities can also result in similar impacts. With the implementation of good waste management practices at the site, adverse environmental impacts would not be expected to arise from the storage, handling and transportation of general refuse. The number of construction workers to be employed is estimated to be about 60. Based on a generated rate of 0.65 kg per worker per day and a recycling rate of 48% (being the rate of recycling in Hong Kong in 2011, from Monitoring of Solid Waste in Hong Kong, Waste Statistics for 2011, by Environmental Protection Department), the maximum daily arising and recycling of general refuse during the construction phase would be approximately 39 kg and 19 kg respectively.

With careful planning for the handling of general refuse on site and proper implementation of waste management practices as described in **Section 7.6.1.5** and **Table 7.5**, the secondary environmental impacts and potential impacts arising from on site waste handling of the general refuse is expected to be minimal.

Table 7.3 provides a summary of the waste types that are likely to be generated from construction phase of the Project, together with the recommended disposal methods.

Table 7.3: Summary of Waste Generation during Construction Phase

Waste Type	Source of Generation	Estimated Total Amount to be Generated	Amount to be Disposed of
Excavated Materials	Site formation and foundation works	25,000 m ³	20,500 m ³
C&D Materials	Demolition works, building and road construction works	4,000 m ³	3,500 m ³
Chemical Waste	Maintenance of construction plant and equipment (cleaning fluids, solvents and lubrication oil)	Insignificant	Insignificant
General Refuse	Construction workforce (food scraps, waste paper, empty containers, etc)	39 kg/day	20 kg/day

7.5.2 Operation Phase

7.5.2.1 Wastes Generated from Pre-Treatment Process

Although source-separated organic wastes are collected for treatment during the Project's operation, a contamination rate of 5-10% could still occur in the waste stream. In order to minimise the contamination rate and to maximise the process efficiency, waste sorting should be carried out on site to separate contaminants / non-organics from the feedstock before putting it through the treatment processes. Therefore, with a daily throughput of approximately 300 tonnes the amount of wastes to be generated from the pre-treatment process is projected to be around 23 tonnes per day (tpd).

Rapid and effective collection of such wastes would be required to prevent waste materials being blown around by wind, flushing into the nearby streams, or causing visual impacts. With food waste being a major component of organic wastes, if the reception and the storage of pre-treated material is not well maintained and cleaned regularly, the site may be attractive to pests and vermin, and also cause odour nuisance. Disposal of such waste at sites other than approved waste transfer or disposal facilities can result in similar impacts. With the implementation of good waste management practices on-site as described in **Section 7.6.2.3** and **Table 7.6**, adverse environmental impacts arising from the storage, handling and transportation of wastes generated from the pre-treatment process would be minimal.

7.5.2.2 Chemical Waste

Small amounts of chemical waste in the form of cleaning fluids, solvents and lubrication oil would be generated during regular maintenance and servicing of on-site mechanical equipment. Also around 10 to 15 tonnes of by products from the desulphurization process of the odour treatment plant would be generated annually and would be disposed of on a monthly basis.

Chemical waste can pose serious environmental, health and safety hazards if not properly managed in accordance with the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on Packaging, Labelling and Storage of Chemical Wastes.

Should any chemical waste be potentially generated, the Operator must register with EPD as a chemical waste producer. The chemical wastes would be readily accepted for disposal at the CWTC in Tsing Yi. These chemical wastes should be collected periodically in drum-type containers by licensed chemical waste collectors. With proper storage, handling and disposal of small amounts of chemical waste in

accordance with the relevant mitigation measures recommended in **Section 7.6.2.4** and **Table 7.6**, adverse environmental impacts are not anticipated.

7.5.2.3 General Refuse

The quantity of general refuse generated by visitors and on-site staff during daily operation of the Project would not be substantial. With the implementation of good waste management practices established by a proper Waste Management Plan (WMP), potential environmental impacts arising from the handling and disposal of the general refuse would be negligible.

Potential environmental impacts arising from the handling and disposal of the general refuse would be negligible and would not cause major environmental concerns, provided that the mitigation measures and appropriate site practices suggested in **Section 7.6.2.5** and **Table 7.6** are implemented.

Table 7.4 provides a summary of the waste types that are likely to be generated during the operation phase of the Project, together with the recommended disposal methods.

Table 7.4: Summary of Waste Generation during Operation Phase

Waste Type	Source of Generation	Estimated Total Amount to be Generated	Amount to be Disposed of
Wastes generated from pre-treatment process	During pre-treatment sorting of organic waste feedstock	23 tonnes/day	23 tonnes/day
Chemical Waste	From plant, equipment, machinery maintenance, servicing and desulphurization process	15 tonnes/year	1.25 tonnes/month
General Refuse	Visitors and on-site staff	Insignificant	Insignificant

7.6 Mitigation of Adverse Environmental Impacts

7.6.1 Construction Phase

7.6.1.1 Good Site Practices

Adverse environmental impacts in relation to waste management are not expected, provided that good site practices are strictly followed. Recommendation for good site practices during the construction phase would include:

- Obtain the relevant waste disposal permits from appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and subsidiary Regulations and the Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Provide staff training for proper waste management and chemical handling procedures;
- Provide sufficient waste disposal points and regular waste collection;

- Provide appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- Carry out regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Separate chemical wastes for special handling and disposal to licensed facilities for treatment; and
- Employ licensed waste collectors to collect waste.

7.6.1.2 Waste Reduction Measures

Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Design foundation works to minimise the amount of excavated material to be generated;
- Provide training on the importance of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling;
- Sort demolition debris and excavated materials from demolition works to recover reusable/recyclable portions (i.e. soil, broken concrete, metal, etc);
- Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage the collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the workforce; and
- Plan and stock construction materials carefully to minimise the amount of waste to be generated and to avoid unnecessary generation of waste.

In addition to the above measures, specific mitigation measures are recommended below for the identified waste so as to minimise environmental impact during handling, transportation and disposal of waste.

7.6.1.3 Excavated and C&D Materials

In order to minimise the impact resulting from collection and transportation of C&D material for off-site disposal, the excavated material arising from site formation and foundation works should be reused on-site as backfilling material and for landscaping works as far as practicable. Other mitigation requirements are listed below:

- A Waste Management Plan (WMP), which becomes part of the Environmental Management Plan (EMP), should be prepared in accordance with ETWB TC(W) No.19/2005;
- A recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites) should be adopted for easy tracking; and

- In order to monitor the disposal of excavated and non-inert C&D material at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be adopted (refer to DEVB TC(W) No. 6/2010).

The Contractor should prepare and implement an EMP in accordance with ETWB TC(W) No. 19/2005 which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from construction activities. Such a management plan should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The EMP should be submitted to the Engineer for approval. The Contractor should implement waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated by the Contractor, preferably on a monthly basis.

All surplus excavated and C&D materials arising from or in connection with works should become the property of the Contractor when it is removed unless otherwise stated. The Contractor would be responsible for devising a system to work for on-site sorting of excavated and C&D materials and promptly removing all sorted and process materials arising from the construction activities to minimise temporary stockpiling on-site. The system should be included in the EMP identifying the source of generation, estimated quantity, arrangement for on-site sorting, collection, temporary storage areas and frequency of collection by recycling Contractors or frequency of removal off-site.

7.6.1.4 Chemical Wastes

Should chemical wastes be produced at the construction site, the Contractor would be required to register with EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste (such as explosive, flammable, oxidizing, irritant, toxic, harmful, or corrosive). The Contractor should employ a licensed collector to transport and dispose of the chemical wastes, to either the CWTC in Tsing Yi, or any other licensed facilities, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

7.6.1.5 General Refuse

General refuse should be stored in enclosed bins or compaction units separated from excavated and non-inert C&D material. A licensed waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. An enclosed and covered area should preferably be provided to reduce the occurrence of 'wind blown' light-weight material.

Table 7.5 provides a summary of the various waste types likely to be generated during the construction phase, together with the recommended handling and disposal methods.

Table 7.5: Summary of Waste Handling Procedures and Disposal Routes during Construction Phase

Waste Type	Estimated Total Amount to be Generated	Amount to be Disposed of	Handling Procedure	Recommended Disposal Outlets
Excavated Materials	25,000 m ³ (total)	4,500 m ³	Segregate and store materials in different containers, skips or stockpiles to avoid contamination and to enhance reuse of materials and proper disposal	Reuse on site as far as practicable
		20,500 m ³		Public fill reception facilities
C&D Materials	4,000 m ³ (total)	500 m ³	Segregate and store materials in different containers, skips or stockpiles to avoid contamination and to enhance reuse of materials and proper disposal	Reuse on site as far as practicable
		2,700 m ³		Public fill reception facilities
		800 m ³		Reuse and recycle as much as possible before disposal of at landfills
Chemical Waste	Insignificant	Insignificant	Stored on-site in suitably designed containers before being collected and disposed of by licensed collector	Recycle by licensed facility and / or dispose of at CWTC
General Refuse	39 kg/day (total)	19 kg/day	Provide on-site refuse collection points	Reuse or recycle as much as possible
		20 kg/day		Deliver to NENT Landfill

7.6.2 Operation Phase

7.6.2.1 Good Site Practices

Adoption of the following good operational practices should be recommended to minimise waste management impacts:

- Obtain the necessary waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Chemical Waste) (General) Regulation and the Land (Miscellaneous Provision) Ordinance (Cap. 28);
- Nomination of an approved person to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site;
- Use of a waste haulier licensed to collect specific category of waste;
- A trip-ticket system should be included as one of the contractual requirements and implemented by the Environmental Team to monitor the disposal of solid wastes at public filling facilities and landfills, and to control fly tipping. Reference should be made to DEVB TC(W) No. 06/2010.
- Training of site personnel in proper waste management and chemical waste handling procedures;
- Separation of chemical wastes for special handling and appropriate treatment at a licensed facility;
- Routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors;

- Provision of sufficient waste disposal points and regular collection for disposal;
- Adoption of appropriate measures to minimise windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers; and,
- Implementation of a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites).

7.6.2.2 Waste Reduction Measures

Good management and control can prevent the generation of significant amounts of waste. Adoption of the following good operational practices should be recommended to ensure waste reduction:

- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal;
- Encourage collection of aluminium cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors. Separate labelled bins should be provided to help segregate this waste from other general refuse generated by the work force; and
- Any unused chemicals or those with remaining functional capacity should be reused as far as practicable.

7.6.2.3 Wastes Generated from Pre-Treatment Process

Wastes generated from pre-treatment process should be recycled as far as possible. Wastes generated from pre-treatment process should also be separated from any chemical waste and stored in covered skips. The recyclables should be collected by licensed collectors, while the rest of the waste should be removed from the site on a daily basis to minimise odour, pest and litter impacts. Open burning must be strictly prohibited.

7.6.2.4 Chemical Waste

Chemical waste generated from machinery maintenance and servicing should be managed in accordance with the Code of Practice on the Packaging, Labelling and storage of Chemical Wastes under the provisions of Waste Disposal (Chemical Waste) (General) Regulation. The chemical waste should be collected by drum-type containers and, when transported off-site, removed by licensed chemical waste contractors. Alternatively, some of the chemical waste may be retained on-site for re-use by the Project in the manufacture of biogas or other products, subject to their composition being confirmed as suitable for such application.

Plant / equipment maintenance schedules should be planned in order to minimise the generation of chemical waste.

Non-recyclable chemical wastes and lubricants should be disposed of at appropriate facilities, such as CWTC. Copies or counterfoils from collection receipts issued by the licensed waste collector should be kept for recording purpose.

Recyclable chemical waste will be transported off-site for treatment by a licensed collector. The Contractor will need to register with EPD as a chemical waste producer.

7.6.2.5 General Refuse

Waste generated in site offices should be reduced through segregation and collection of recyclables. To promote the recycling of wastes such as used paper, aluminium cans and plastic bottles, it is recommended that recycling bins should be clearly labelled and placed at locations with easy access. For the collection of recyclable materials, they should be collected by licensed collectors.

General refuse, other than segregated recyclable wastes, should be separated from any chemical waste and stored in covered skips. The general refuse should be removed from the site on a daily basis to minimise odour, pest and litter impacts. Also, open burning of refuse must be strictly prohibited.

Table 7.6 provides a summary of the various waste types likely to be generated during the operation phase, together with the recommended handling and disposal methods.

Table 7.6: Summary of Waste Generation during Operation Phase

Waste Type	Estimated Total Amount to be Generated	Amount to be Disposed of	Handling Procedure	Recommended Disposal Outlets
Wastes generated from pre-treatment process	23 tonnes/day	23 tonnes/day	Provide on-site collection points	Reuse or recycle as much as possible before delivering to NENT Landfill
Chemical Waste	15 tonnes/year	1.25 tonnes/month	Stored on-site in suitably designed containers before being collected and disposed of by licensed collector	Recycle by licensed facility and/or dispose of at CWTC
General Refuse	Insignificant	Insignificant	Provide on-site refuse collection points	Reuse or recycle as much as possible before delivering to NENT Landfill

7.6.3 Impacts Caused by Handling, Collection and Disposal of Waste

The assessment of these impacts should cover the following: potential hazard, air and odour emission, noise and wastewater discharge. With the implementation of mitigation measures recommended in **Sections 7.6.1** and **7.6.2**, impacts from the handling, collection and disposal of waste expected to be minimal. The issue would be addressed in other relevant sections of this EIA report.

7.6.4 Contamination during Operational Phase

With reference to Clause 3.4.7 of the EIA Study Brief, the assessment of waste management implications arising from construction and operation of the Project shall follow the detailed technical requirements given in Appendix E of the EIA Study Brief.

The following tasks have been conducted in accordance with the *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* and the *Guidance Note for Contaminated Land Assessment and Remediation* to prevent potential contamination problems during the operational phase of the Project:

- Identify the possible sources of contamination associated with the operation of the Project; and
- Formulate appropriate operational practices, waste management strategies and precautionary measures for the prevention of contamination problems.

7.6.4.1 Potential Sources of Contamination

Chemicals would be used during operation phase and thus it is expected that some chemical wastes would be generated from the Project. Without proper management of the chemicals and chemical wastes, there is potential for land contamination due to uncontrolled spillages, or improper handling and disposal of these materials.

The expected types and quantities of the materials involved in operation of the Project with contamination potential are presented in **Table 7.7**.

Table 7.7: Materials to be used during Operation Phase of the Project with Land Contamination Potential

Material	Expected Annual Consumption/Production	Estimated Quantities to be Stored On-site
Diesel Fuel	100-200 m ³	4-5 m ³
Lubrication Oil	10-20 m ³	2-5 m ³
Flocculation Agent	50-60 m ³	2-5 m ³

Chemical wastes would arise if chemicals are over-ordered and cannot be consumed before the expiry of the chemicals. Only a minimum amount of waste lubrication oil is expected to be generated during operation phase.

7.6.5 Approach to Prevent Land Contamination

7.6.5.1 Fuel Oil Spillage Prevention

Precautionary measures to prevent fuel oil spillage are as follows:

(i) Fuel Oil Containers

- Fuel oil should be stored in suitable containers;
- All fuel oil containers should be securely closed;
- Appropriate labels showing the name of fuel oil should be posted on the containers; and
- Drip trays should be provided for all containers.

(ii) Storage Area

- Distance between the fuel oil refuelling points and the fuel oil containers should be minimised;
- The storage area should be used for fuel oil storage only;
- No surface water drains or foul sewers should be connected to the storage area; and
- The storage area should be enclosed by three sides by a wall and have an impermeable floor or surface.

(iii) Fuel Oil Spillage Response

An Oil Spill Response Plan should be prepared by the operator to document the appropriate response procedures for oil spillage incidents in detail. General procedures to be taken in case of fuel oil spillage are presented below.

Training

Training on oil spill response actions should be given to relevant staff. The training should cover the following:

- Tools and resources to combat oil spillage and fire, e.g. locations of oil spill handling equipment and fire fighting equipment;
- General methods to deal with oil spillage and fire incidents;
- Procedures for emergency drills in the event of oil spills and fire; and
- Regular drills should be carried out.

Communication

Establish communication channel with the Fire Services Department (FSD) and EPD to report any oil spillage incident so that necessary assistance from relevant department could be quickly sought.

Response Procedures

Any fuel oil spillage within the Project Site should be immediately reported to the Site Manager with necessary details including location, source, possible cause and extent of the spillage.

Site Manager should immediately attend to the spillage and initiate any appropriate action to confine and clean up the spillage. The response procedures should include the following:

- Identify and isolate the source of spillage as soon as possible.
- Contain the oil spillage and avoid infiltration into soil/ groundwater and discharge to storm water channels.
- Remove the oil spillage.
- Clean up the contaminated area.
- If the oil spillage occurs during refuelling, the refuelling operation should immediately be stopped.

Recovered contaminated fuel oil and the associated material to remove the spilled oil should be considered as chemical waste. The handling and disposal procedures for chemical wastes are discussed in the following paragraphs.

7.6.5.2 Chemical and Chemical Wastes Handling & Spillage Prevention

The precautionary measures to prevent improper handling / use of chemicals and chemical waste spillage are presented below:

(i) Chemicals and Chemical Wastes Handling & Storage

- Chemicals and chemical wastes should only be stored in suitable containers in purpose-built areas;
- The storage of chemical wastes should comply with the requirements of the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes;
- The storage areas for chemicals and chemical wastes should have an impermeable floor or surface. The impermeable floor / surface should possess the following properties:
 - Not liable to chemically react with the materials and their containers to be stored;
 - Able to withstand normal loading and physical damage caused by container handling; and
 - The integrity and condition of the impermeable floor or surface should be inspected at regular intervals to ensure that it is satisfactorily maintained;
- For liquid chemicals and chemical wastes storage, the storage area should be banded to contain at least 110% of the storage capacity of the largest containers or 20% of the total quantity of the chemicals/chemical wastes stored, whichever is the greater;
- Storage containers should be checked at regular intervals for their structural integrity and to ensure that the caps or fill points are tightly closed; and
- Chemical handling should be conducted by trained workers under supervision.

(ii) Chemicals and Chemical Wastes Spillage Response

A Chemicals and / or Chemical Wastes Spillage Response Plan should be prepared by the operator to document in detail the appropriate response procedures for chemicals or chemical wastes spillage incidents. General procedures to be undertaken in case of chemicals / chemical waste spillages are presented below.

Training

Training on spill response actions should be given to relevant staff. The training should cover the following:

- Tools & resources to handle spillage, e.g. locations of spill handling equipment;
- General methods to deal with spillage; and
- Procedures for emergency drills in the event of spills.

Communication

Establish communication channel with Fire Services Department (FSD) and EPD to report the spillage incident so that necessary assistance from relevant department could be quickly sought.

Response Procedures

Any spillage within the Project site should be reported to the Site Manager.

Site Manager shall attend to the spillage and initiate any appropriate actions needed to confine and clean up the spillage. The response procedures should include the following:

- Identify and isolate the source of spillage as soon as possible;
- Contain the spillage and avoid infiltration into soil / groundwater and discharge to storm water channels (in case the spillage occurs at locations out of the designated storage areas);
- Remove the spillage; the removal method / procedures documented in the Material Safety Data Sheet (MSDS) of the chemicals spilled should be observed;
- Clean up the contaminated area (in case the spillage occurs at locations out of the designated storage areas); and
- The waste arising from the cleanup operation should be considered as chemical wastes.

7.6.5.3 Incident Record

After any spillage, an incident report should be prepared by the Site Manager. The incident report should contain details of the incident including the cause of the incident, the material spilled and estimated spillage amount, and also the response actions undertaken. The incident record should be kept carefully and able to be retrieved when necessary.

The incident report should provide sufficient details for the evaluation of any environmental impacts due to the spillage and assessment of the effectiveness of measures taken.

In case any spillage or accidents results in significant land contamination, EPD should be informed immediately and the Project operator should be responsible for the clean up of the affected area. The response procedures described in **Sections 7.6.5.1 to 7.6.5.2** above should be followed accordingly together with the land contamination assessment and remediation guidelines stipulated in the Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management and the Guidance Note for Contaminated Land Assessment and Remediation.

7.7 Evaluation of Residual Impacts

With the implementation of mitigation measures recommended for the handling, transportation and disposal of the identified waste arisings, no residual impact is expected to arise during the construction and operation stages of the proposed Project.

7.8 Environmental Monitoring and Audit

It would be the Contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with the recommended good waste management practices and EPD's regulations and requirements. A WMP which would become part of the EMP should be prepared in accordance with ETWB TC(W) No. 19/2005 by the Contractor. Mitigation measures recommended in this section should form the basis of the WMP.

Waste materials generated from construction activities, such as excavated materials, C&D materials and general refuse, are recommended to be audited at regular intervals to ensure that proper storage, transportation and disposal practices are being implemented. The Contractor would be responsible for the implementation of mitigation measures to minimise waste or redress problems arising from the waste materials.

7.9 Conclusion

Waste types to be generated during the construction phase of the Project would likely to include excavated materials (from site formation and foundation works), C&D materials (from mixture of topsoil and dead vegetative material and surplus concrete or grouting mixes), chemical waste (from maintenance of construction plant and equipment) and general refuse (from construction workforce). Provided that waste is handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be expected during the construction phase.

During the operation phase of the Project, waste types to be generated would likely include wastes generated from pre-treatment processes (from pre-treatment sorting of organic waste feedstock), chemical wastes (from maintenance of mechanical equipment) and general refuse (from visitors and on-site staff). Provided that waste is also handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts would not be anticipated during the operation phase.

Potential sources of contamination in the operation phase have been identified. It is estimated that limited amount of chemicals or chemical wastes would be used / produced during the operation. Good practices and response procedures for contamination prevention have been recommended. With proper implementation of the recommended practices and procedures, the potential for contamination due to the operation of the Project is expected to be minimal.